

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

## PCT

To:

see form PCT/ISA/220

### WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/L2004/001169

International filing date (day/month/year)  
26.12.2004

Priority date (day/month/year)  
15.01.2004

International Patent Classification (IPC) or both national classification and IPC  
G06T7/60

Applicant  
ALGOTEC SYSTEMS LTD.

**1. This opinion contains indications relating to the following items:**

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

**2. FURTHER ACTION**

If a demand for International preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

**3. For further details, see notes to Form PCT/ISA/220.**

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/IL2004/001169

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**Box No. IV Lack of unity of invention**

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1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
  - ☐ paid additional fees under protest.
  - ☒ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
  - ☒ not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
  - ☒ the parts relating to claims Nos. 1-72 and 86-95

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-72, 86-94
	No: Claims	
Inventive step (IS)	Yes: Claims	1-72, 86-94
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-72, 86-94
	No: Claims	

2. Citations and explanations

**see separate sheet**

As to claims 1-72, 86-94 and claims 73-80:

The principal common feature of "segmentation" present in both claims 1 and 73, 77 and 79 is a well-known concept in the art and therefore known to the skilled person. Claim 1 is silent about any special segmentation method and thus the remaining features of said claims which represent the contribution over the known art differ completely thereby leading to a lack of unity (Rule 13 PCT).

As to claims 1-72, 86-94 and claims 81-80:

No common features can be established between said groups of claims, thereby leading to a lack of unity (Rule 13 PCT).

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 3 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

**3. Item V: Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 3.1 The present application meets the requirements of Articles 33(2) and 33(3) PCT because the subject matter of claims 1-72 and 86-94 is novel and involves an inventive step, the reasons being as follows:

As to claim 1:

D1 discloses:

A method of centerline determination for a tubular tissue in a medical image data set defined in a data space (see page 68, lines 1-18), comprising:

- receiving at least one start point and one end point inside a tubular tissue volume (see page 69, lines 8-9);
- automatically determining a path between said points that remains inside said volume (see page 69, lines 9-11);

1. Reference is made to the following documents:

- D1: Li et al.: "Combining front propagation with shape knowledge for accurate curvilinear modelling" Medical Image Computing and Computer-Assisted Intervention - MICCAI 2003. 6th International Conference. Proceedings. Part II (Lecture Notes in Comput. Sci. Vol. 2879) Springer-Verlag Berlin, Germany, 2003, pages 66-74
- D2: Deschamps et al.: "Fast extraction of minimal paths in 3D images and applications to virtual endoscopy" Medical Image Analysis, Oxford University Press, Oxford, GB, vol. 5, 2001, pages 281-299
- D3: Cohen et al.: "Global minimum for active contour models: A minimal path approach" International Journal of Computer Vision, Kluwer Academic Publishers, Norwell, US, vol. 24, no. 1, August 1997, pages 57-78
- D4: Wink et al.: "3D MRA coronary axis determination using a minimum cost path approach" Magnetic Resonance in Medicine, Academic Press, Duluth, MN, US, vol. 47, no. 6, June 2002, pages 1169-1175
- D5: Maddah et al.: "Efficient center-line extraction for quantification of vessels in confocal microscopy images" Medical Physics, American Institute of Physics, New York, US, vol. 30, no. 2, February 2003, pages 204-211

2. **Item IV: Lack of unity of invention**

This Authority considers that there are 3 inventions covered by the claims indicated as follows:

- I: Claims 1-72 and 86-94 directed to centerline finding for a tubular tissue in a medical data set.
- II: Claims 73-80 directed to segmentation of an organ in a medical data set
- III: Claims 81-85 directed to propagation of a parametrization in a medical data set

The reasons for which the inventions are not so linked as to form a single general inventive concept, as required by Rule 13.1 PCT, are as follows:

As to claims 1-72, 86-94 and claims 73-80:

The principal common feature of "segmentation" present in both claims 1 and 73, 77 and 79 is a well-known concept in the art and therefore known to the skilled person. Claim 1 is silent about any special segmentation method and thus the remaining features of said claims which represent the contribution over the known art differ completely thereby leading to a lack of unity (Rule 13 PCT).

As to claims 1-72, 86-94 and claims 81-80:

No common features can be established between said groups of claims, thereby leading to a lack of unity (Rule 13 PCT).

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 3 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

**3. Item V: Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 3.1 The present application meets the requirements of Articles 33(2) and 33(3) PCT because the subject matter of claims 1-72 and 86-94 is novel and involves an inventive step, the reasons being as follows:

As to claim 1:

D1 discloses:

A method of centerline determination for a tubular tissue in a medical image data set defined in a data space (see page 68, lines 1-18), comprising:

- receiving at least one start point and one end point inside a tubular tissue volume (see page 69, lines 8-9);
- automatically determining a path between said points that remains inside said volume (see page 69, lines 9-11);

- automatically segmenting said tubular tissue using said path (see page 69, lines 9-11 and page 70, line 17- page 71, line 5); and
- automatically determining a centerline for said tubular tissue from said segmentation (see page 70, line 17- page 71, line 5)

D1 however does not disclose:

- wherein said receiving, said determining a path and said segmenting, said determining a centerline are all performed on a same data space of said medical image data set.

The method of D1 computes a distance field, so that the operations do not take place within the same data space of medical image data set.

This is also not disclosed in any of the other available prior art on file.

- 3.2 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claim 86, which therefore is also considered new and inventive.
- 3.3 The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 3.4 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 3.5 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D5 is not mentioned in the description, nor are these documents identified therein.